Abyssal benthic Amphipoda (Crustacea) from the East Iceland Basin

1. The genus *Rhachotropis*

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Introduction

Cruise 39 of R.R.S. *Discovery,* made in April-June 1971, was concerned with biological projects in the north-east Atlantic Ocean. Major programmes involved intensive investigations of the vertical distribution and diurnal migration of planktonic and nektonic organisms at 60°N 20°W and 53°N 20°W. As an adjunct to the midwater work at the northern station, five hauls were made with a large epibenthic sledge at depths of 2600–2800m on the floor of the East Iceland Basin.

The present paper, describing species of the eusirid genus *Rhachotropis,* is the first to deal with the 120 species of gammaridean amphipods recovered from these benthic samples.

A considerable body of data is available on the bathyal and abyssal gammarid amphipods of the temperate north Atlantic Ocean. Among the more important contributions are those of Bonnier (1896), Chevreux (1900, 1927, 1935), Stephensen (1915, 1923, 1925, 1931, 1944*a*) and Mills (1967, 1971). Evidence summarized by Briggs (1974: 390) suggests that the bathyal and abyssal fauna of the Greenland and Norwegian Seas (and the Arctic Basin as a whole) is fairly distinct from that of the North Atlantic, but data on the deep-dwelling amphipods of these areas are relevant to the present study. Major works are those of Boeck (1876) and Sars (1885). Regional studies dealing mainly with shallow water faunas, but including data on slope species include the works of Sars (1890–1895), Stephensen (1933, 1935, 1938, 1940*a, b,* 1942, 1944*b*) and Gurjanova (1951).

The past twenty years have seen an upsurge in interest in the fauna of the deep sea. Investigations have shown that the bathyal and abyssal biomass is, in general, lower by several orders of magnitude (see, for example, Zenkevitch, 1963: 723) than that of the continental shelf and upper continental slope. Despite the low biomass, the number of species represented is frequently high (see, for example, Barnard (1962), Menzies (1962), Sanders *et al* (1965)), so much so that the species diversity is higher at these depths than in many other shallower and more productive marine environments (Hessler & Sanders (1967), Sanders (1968)). The nature and causes of high diversity have been discussed by Sanders (1969), Sanders & Hessler (1969), Dayton & Hessler (1972) and Grassle & Sanders (1973).

The collecting effort which has been devoted to sampling the deep sea benthos in recent years has made available large quantities of biological material. Problems of sorting and identification of organisms has led to much of this material being studied in general terms only, identification being made to phylum, class or perhaps order. One of the major problems in detailed studies is the lack of taxonomic effort currently available. Barnard (1958) highlighted this problem for the Gammaridea. He showed that despite the great increases in material available for study, the systematic activity was considerably less than during the 1930s. Although Barnard himself has made massive contributions to amphipod systematics, the problem is still acute, and effort is not commensurate with the volume of specimens being obtained. Many of the major faunules are still very poorly known (witness Barnard (1972, 1974) working on non-domicolous, non-fossorial amphipods from shallow water environments in warm temperate Australia, who discussed 47 genera of which 18 were

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new, and 124 species of which 84 were new). That systematic effort is still a prime requisite in the study of deep sea amphipods is shown by a series of four papers by Barnard (1961, 1962, 1964, 1967). In the four collections dealt with 64%, 63%, 59% and 52% respectively of the species discussed were new to science. The relatively low figure of 52% reflects previous work in the same small area by Barnard himself (1966).

Brook (1974), in discussing the zoogeography of the deep sea, has collated data from many sources which indicate that most invertebrate groups, including amphipods (see Barnard (1962)), contain a high proportion of species which appear to be endemic to single ocean basins. Although future work may well reduce the apparently high endemicity in the deep sea, there is no indication that the descriptive effort within the Gammaridea, and probably most other major invertebrate groups, has reached a level of diminishing returns.

Taxonomy, although a legitimate end in itself, should also serve as a tool for further studies in the ecology, physiology, zoogeography and related disciplines of the organisms concerned. It is in this light that the present paper is presented.

Material and methods

The five epibenthic sledge hauls made in the vicinity of 60°N 20°W produced 267 specimens of *Rhachotropis*. These specimens represented 7·5% of the total amphipod catch.

The epibenthic sledge, designated BN2·4, which was used to obtain these samples, is a modified beam trawl with a mouth area of 2·4m². The framework consists of two vertical, oval structures, each equipped with a broad skid to prevent sinking in soft bottoms and connected at the top by two transverse metal bars. The net, which is 6·10m long and with a mouth 2·44m, by 0·91m, is made of 4·5mm mesh. It is lined for 2·44m in front of the canvas cod-end with 1mm netting. The net is laced to the rearmost of the two transverse bars on the framework, clipped to vertical side wires and laced to a solid bottom bar which is connected by weak links to the heel of the skid of each vertical frame. The sides and top of the main framework are lined with 6mm polypropylene mesh to prevent the escape of animals disturbed by the tickler chain. A depth telemetering pinger akin to that discribed by Clarke (1969), but incorporating a mercury switch, was attached to the framework of the net. This device monitored the changes in angle of attack of the sledge which marked arrival on and departure from the bottom. A subsequent modification of this sledge which incorporates photographic and opening/closing capabilities is designated BN 1·5 and has been described by Aldred *et al* (1976).

Catches consisted of animals and a variable, but usually large, volume of sediment. Large and delicate organisms were picked out of the sediment prior to sieving through 2mm and 500μm meshes. The separated fractions were fixed in 5% formalin and transferred to 70% alcohol 48–72 hours later. Some amphipods were picked out during initial shipboard sorting, but most were recovered in the laboratory.

The positions listed in Table 1 are best estimates of the first and last bottom contact for each haul. Positions, depths and lengths of haul have been calculated from satellite navigation fixes and precision echosounder records.

Thoracic limbs are referred to as gnathopods 1–2 and peraeopods 3–7. Lengths have been taken on straightened animals and were measured from the tip of the rostrum to the tip of the telson. Males have been identified by the presence of genital papillae and females by oostogites; all other specimens being regarded as juveniles.

The specific epithets applied to new species are derived from personal names occurring in the rich Icelandic literature of the Viking period.

Systematics

Over 3500 specimens of gammarid amphipod belonging to about 120 species were obtained from the five epibenthic sledge hauls. Although several species, particularly some lysianassids, were probable contaminants from meso- and bathypelagic midwater zones, a preliminary examination suggests that 94% of the species and over 99% of the specimens were

benthic in origin. These data suggest that contamination of catches by midwater organisms is of little significance. This observation is supported by the very small catches made during other hauls which were terminated without bcttom contact.

Over 50% of the benthic species appear to be undescribed. This proportion of new species corresponds closely with the levels found in similar collections studied by Barnard (see above).

The bottom sampled by all five hauls consisted of dark grey-brown mud containing small quantities of larger particles together with some pteropod shells (mainly *Diacria trispinosa*).

Table 1 Station List

Station	Date	Position	Gear	Depth	Length of haul (m)
7709 #62	1 May 1971	59°58·8′N 19°58·2′W – 59°58·8′N 19°58·8′W	BN2·4	2714(–0)m	1010
7709 #66	3 May 1971	59°59·4′N 19°53·5′W – 59°58·3′N 19°53·5′W	BN2·4	2712(–0)m	2150
7709 #72	5 May 1971	60°05·7′N 19°43·3′W – 60°06·8′N 19°42·5′W	BN2·4	2663–2649(–0)m	2450
7709 #73	5 May 1971	60°07·5′N 19°32·4′W – 60°06·4′N 19°26·6′W	BN2·4	2646–2636(–0)m	9460
7709 #85	7 May 1971	59°58·6′N 19°53·4′W – 59°58·1′N 19°54·3′W	BN2·4	2708(–0)m	1690

Rhachotropis proxima Chevreux, 1911
(Figs. 1–2)

Rhachotropis proxima Chevreux, 1911: 11–13, fig. 5; 1935: 110–111, pl. 12, fig. 3.—Stephensen, 1944: 15.—Gurjanova, 1955: 184 (in key).—Barnard, 1957: 14.
Rachotropis proxima (err.)—Schellenberg, 1955: 194.—Belloc, 1960: 13.

MATERIAL EXAMINED. Sta. 7709 #62 1♀ 9mm, 4 damaged specimens; Sta. 7709 #66 1 damaged specimen; Sta. 7709 # 72 5♂ 12–14mm, 1 ovig. ♀ 17mm, 7♀ 14–17mm, 1 juv. 8mm, 2 damaged specimens; Sta. 7709 #73 8♂ 10–15mm, 28♀ 8–15mm, 7 juv. 7–9mm; Sta. 7709 #85 2♂ 9–12mm, 7♀ 14–19mm, 2 damaged specimens.

DESCRIPTION. Male, 15mm, from Sta. 7709 73. *Pleon,* each segment weakly carinate, produced posteriorly into low, acute tooth; segments 1 and 2 with small dorso-lateral teeth on posterior margin. *Epimera,* first rounded ventrally; second produced anterior-ventrally, posteriorly sub-rectangular; third similar in shape to second but with six small teeth at posterior distal angle. *Urosome,* first segment with acute dorsal tooth on posterior margin, lacking lateral carinae.

Head, rostrum long, deep and down-curved, as long as head; eyelobes produced, rounded, eyes not seen; postantennal angle bilobed, weak; epistome just more prominent than upper lip. *Antenna 1,* as long as head, peraeon and first pleon segment combined; first article of penducle rather stout, equal to second and third combined, shorter than rostrum; second and third articles more slender than first, second three times length of third; flagellum more than twice as long as peduncle, basal third somewhat inflated, articles short, bearing many elongate aesthetes medially, distal articles long and slender; accessory flagellum of one article, minute, bearing three setae and a spine apically. *Antenna 2,* as long as head, peraeon and first two pleon segments combined; fifth article of peduncle long and slender, as long as first four peduncle articles combined; flagellum nearly twice as long as peduncle, consisting of 44 slender articles. *Upper lip* entire, truncate distally. *Mandible,* incisor process well

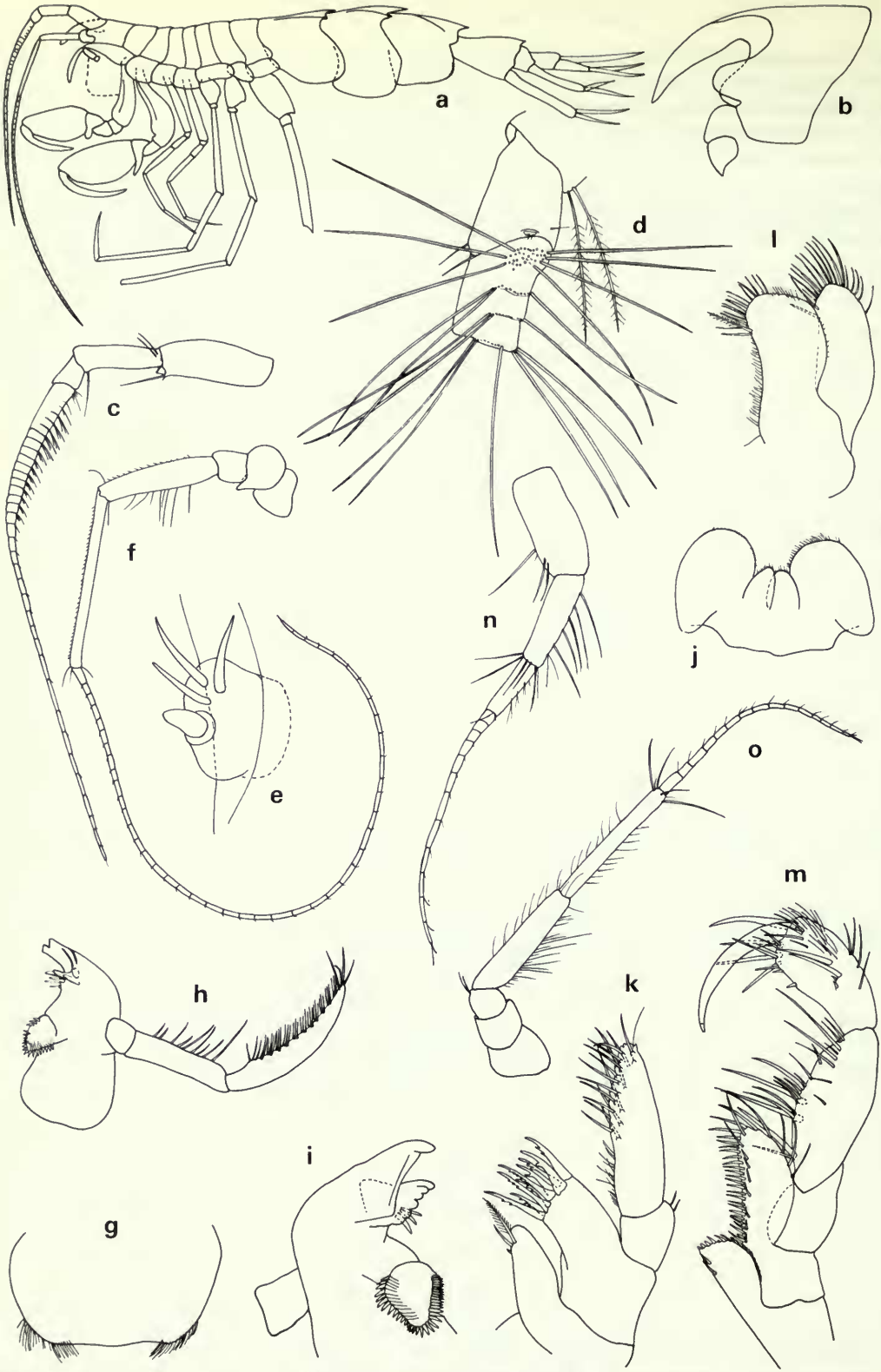

Fig. 1 *Rhachotropis proxima.* Male, 15mm. (a) habitus; (b) head; (c) antenna 1; (d) antenna 1, detail; (e) accessory flagellum; (f) antenna 2; (g) upper lip; (h) right mandible; (i) left mandible, detail; (j) lower lip; (k–l) maxillae 1 & 2; (m) maxilliped. Female, 15mm. (n–o) antennae 1 & 2.

developed with a single tooth and long chitinized cutting edge, lacina mobilis of right mandible with three teeth, of left mandible broader and with six teeth; molar well developed, ridged and bearing marginal teeth; palp longer than body of mandible, third article falciform, densely setose along most of anterior margin, *Lower lip,* inner lobes well developed. *Maxilla 1,* inner plate rather narrow with two subapical setae; outer plate bearing nine slender dentate spines; palp article 2 with serrate, very oblique apex, armed with anterior and posterior rows of setae. *Maxilla 2,* inner plate rather broad, apex rounded, truncate, medial angle armed with stiff setae; outer plate narrower than inner, apically rounded and armed with stiff setae. *Maxilliped,* inner plate small; outer plate narrow with many spine teeth medially; palp strong, second article longest, second and third articles armed with setae and long stout spines, dactyl as long as third article, strongly curved.

Gnathopod 1, coxa strongly produced anteriorly, nearly three times as long as high; basal expanded distally, carpus short, lobed posteriorly; propod oval, palm long, armed with setae; dactyl slender, as long as palm. *Gnathopod 2,* coxa pentagonal; basal expanded distally, armed with group of stout setae at anterior-distal corner; carpus short, with long, slender, heavily spined lobe posteriorly, lobe extending as far as palmar angle of propod; propod oval, rather longer than that of gnathopod 1; dactyl slender, as long as palm. *Peraeopod 3,* coxa small, articles slender; basal as long as articles 3 to 5 combined; carpus nearly twice as long as article 4, subequal in length to propod and to dactyl. *Peraeopod 4,* coxa longer than high, excavate posteriorly, distal articles as in peraeopod 3. *Peraeopod 5,* coxa weakly bilobed, posterior lobe stronger, distally rectangular; basal short, expanded distally; merus elongate, slender; carpus shorter and more slender than merus; propod very long and slender, length more than 20 times width; dactyl very slender, slightly curved, about 40% of length of propod. *Peraeopod 6,* coxa with posterior lobe stronger, rectangular at posterior-distal angle; distal articles similar to those of peraeopod 5. *Peraeopod 7,* coxa just acute posterior-distally; basal nearly twice as long as that of peraeopod 6, posterior distal angle acute; fourth article twice as long as basal, slightly produced posterior-distally; carpus more slender than merus and 20% longer; propod elongate and extremely slender, length 25% greater than that of carpus, maximum width less than 3% of length; dactyl straight, very slender, 25% length of propod.

Uropod 1, inner ramus just longer than outer, shorter than peduncle. *Uropod 2,* extends back to apex of uropod 1; inner ramus just shorter than peduncle, with four small spines on medial margin, outer ramus unarmed, 75% as long as inner ramus. *Uropod 3,* rami lanceolate, subequal, margins minutely pectinate, twice as long as peduncle, inner ramus armed on medial margin, outer on both margins. *Telson* as long as uropod 3, broad, sides parallel, tapering distally, cleft 12% of length, armed dorsally with minute spines.

Female, 15mm, from Sta. 7709 #73. Females attain a larger size than males, reaching 18mm, but differ morphologically only in the broader peraeon and shorter antennae. *Antenna 1,* peduncle and flagellum subequal in length; peduncle article 1 stouter and just longer than article 2, article 3 60% length of article 2; flagellum of 12 articles. *Antenna 2,* peduncle article 5 longer and more slender than article 4; flagellum shorter than peduncle articles 4 and 5 combined, of 15 articles.

REMARKS. Barnard (1957) omitted *R. proxima* from his key to the genus on the grounds of uncertainty concerning the dorsal armature of this species. The present material, which agrees precisely with Chevreux's illustrations, reveals an error in the original description (Chevreux, 1911:11). The reference to the dorsal armature of the mesosome in fact applies to the metasome. No species of *Rhachotropis* has yet been described in which peraeon and urosome are carinate and dentate, but the pleon unarmed.

R. proxima belongs to the group of species characterized by a strongly produced coxa 1, peraeonite 7 without teeth, pleonites 1–3 with three, three and one tooth respectively and urosomite 1 dentate.

Two species, *R. kergueleni* Stebbing, 1888 and *R. hunteri* Nicholls, 1938, agree with these basic characters of *R. proxima. R. proxima* is closely related to *R. kergueleni,* but the

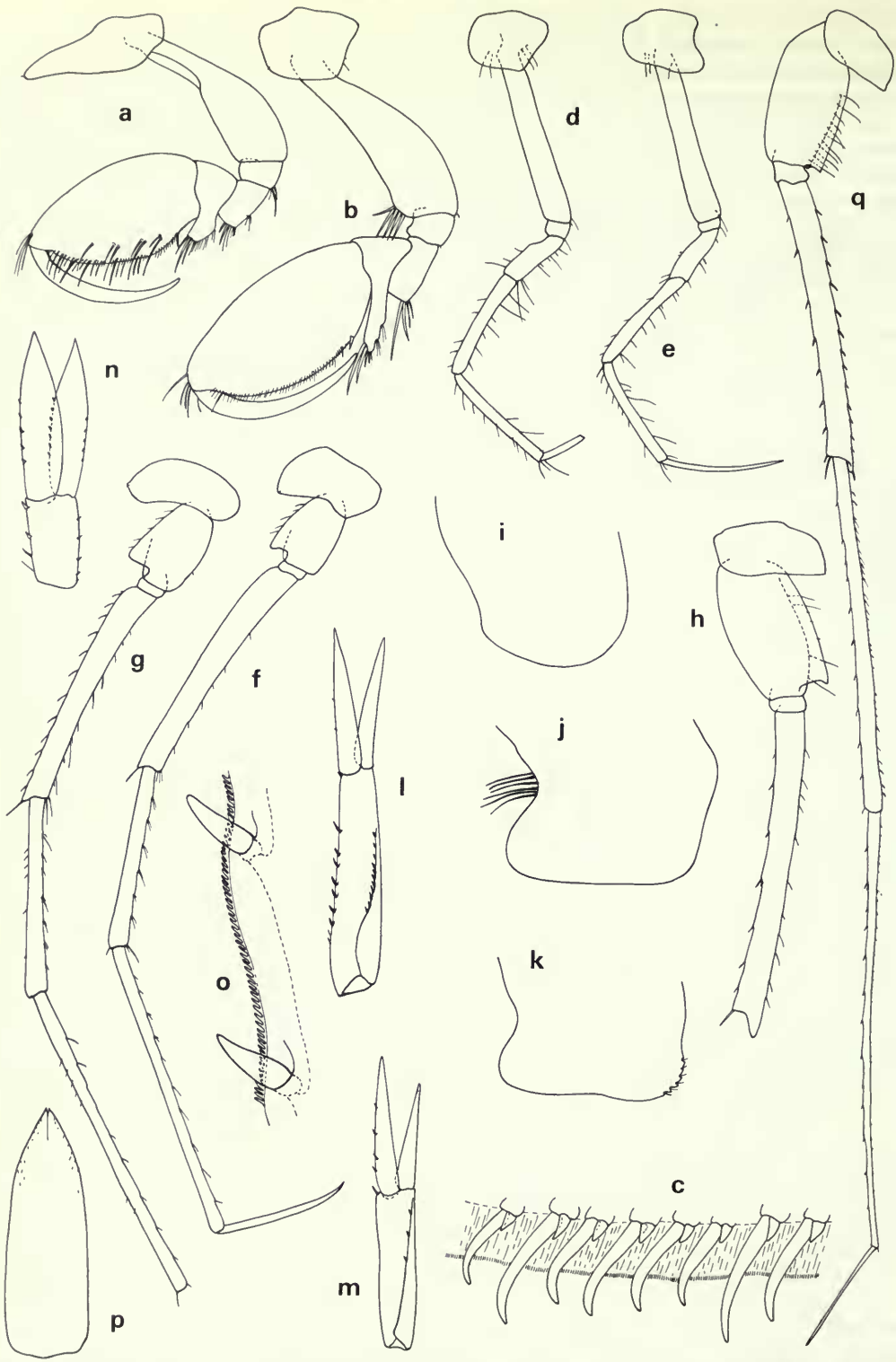

Fig. 2 *Rhachotropis proxima.* Male, 15mm. (a–b) gnathopods 1 & 2; (c) gnathopod 2, detail of palm; (d–h) peraeopods 3–7; (i–k) epimera 1–3; (l–n) uropods 1–3; (o) uropod 3, margin of outer ramus; (p) telson. Male, 14mm. (q) peraeopod 7.

southern hemisphere species has a large tooth on urosomite 1, broadly rounded and strongly serrate epimeron 3, a less deeply cleft telson with divergent apices, and basal articles of peraeopods 5–7 with serrate posterior margins. The distinction between those two species is obscured somewhat by specimens doubtfully assigned to *R. kergueleni* by Stephensen (1944a). In the dehiscent apices of the telson and broadly rounded, strongly serrate epimeron 3, the 'Ingolf' material from the Davis Strait agrees with *R. kergueleni* while the weakly serrate basal articles of peraeopods 5–7 are closer to *R. proxima.* The degree of variation of these characters in the present specimens is minimal so until the status of Stephensen's specimens and the type material of *R. kergueleni* can be clarified, it seems best to exclude both these entities and maintain *R. proxima* as distinct.

Two new species described later in this paper are related to *R. proxima.* One possesses the same basic characters as *R. proxima* and the other differs in the condition of coxa 1. The diagnostic characters are discussed on p. 53 and p. 57 respectively.

A number of other species are also related to *R. proxima. R. levantis* Barnard, 1961 and *R. anoculata* Barnard, 1962 both lack teeth on urosomite 1, have telsons cleft more than 30% of their length, and bear calceoli on the antennae. In addition the shape of the basal articles of peraeopods 5–7 is markedly different in *R. levantis* and *R. proxima.* The dorsal posterior margin of pleonite 3 is prominent but not dentate in *R. anoculata,* thus contrasting with *R. proxima* in which this segment bears a distinct tooth. *R. leucophthalma* Sars, 1893, *R. sibogae* Pirlot, 1934, *R. integricauda* Carausu, 1949, *R. cervus* Barnard, 1957 and *R. flemmingi* Dahl, 1959 all differ from *R. proxima* in possessing dorso-lateral teeth on pleonite 3 in addition to the median tooth. *R. integricauda* is unique in the genus in having an uncleft telson. *R. leucophthalma* and *R. cervus* can also be separated from *R. proxima* by the telson which is cleft 50% and 30% of its length respectively as opposed to 14–17%. *R. sibogae* is further distinguished from *R. proxima* by the broadly rounded coxa 1, the form of epimeron 3 and the divergent apices of the telson. Peraeopod 7 of *R. flemmingi* has an extremely long propod, which is as long as the fourth and fifth articles combined, and a dactyl half the length of the propod. These proportions are significantly different in *R. proxima* as is the condition of epimeron 3. *R. antarctica* Barnard, 1932 and *R. clemens* Barnard, 1967 are separable from *R. proxima* in that they lack teeth on pleonite 3. *R. antarctica* has eyes, dorso-lateral keels on pleonite 1 and on urosomite 1, and a broadly expanded basal article of peraeopod 7, features not present in *R. proxima.* A short rostrum, weakly produced coxa 1, slender basal articles of peraeopods 5 and 6 and a large tooth on urosomite 1 are additional characters separating *R. clemens* from the present species. *R. platycera* Barnard, 1931 is much smaller than *R. proxima,* adults reaching only 4·5mm as opposed to 12–20mm, and has calceolate antennae, eyes, a dorsal tooth on peraeonite 7 and a deeply cleft telson.

Rhachotropis thordisae sp. nov.
(Figs. 3–4)

MATERIAL EXAMINED. Sta. 7709#62 2♂ 10mm, 6♀ 7–11mm, 1 juv. 6mm, 1 damaged specimen; Sta. 7709#72 12♂ 5–10mm, 5 ovig. ♀ 10–11mm, 15♀ 7–12mm, 9 damaged specimens; Sta. 7709#73 12♂ 5–10mm, 1 ovig. ♀ 10mm, 20♀ 7–11mm, 5 juv. 4–6mm, 1 intersex 9mm, 2 damaged specimens; Sta. 7709#85 1♂ 9mm, 5♀ 7–11mm, HOLOTYPE ♂ BM(NH) reg. no. 1978: 218 [carcase and 4 microscope preparations], ALLOTYPE 1978: 219, PARATYPES 1978: 220.

Material from Sta. 7709#85 has been deposited in the collections of the Zoology Department of the British Museum (Natural History), and specimens from the remaining three stations are held at the Institute of Oceanographic Sciences.

ETYMOLOGY. Thordis Thorbjornsdottir, sister of Gisli.

DESCRIPTION. Holotype, male, 9mm. *Pleon,* each segment produced posteriorly into a dorsal tooth; segment 1 with procumbent lateral teeth; segment 2 carinate nearly square in transverse section due to well-developed, dorso-lateral carinae each ending in prominent tooth;

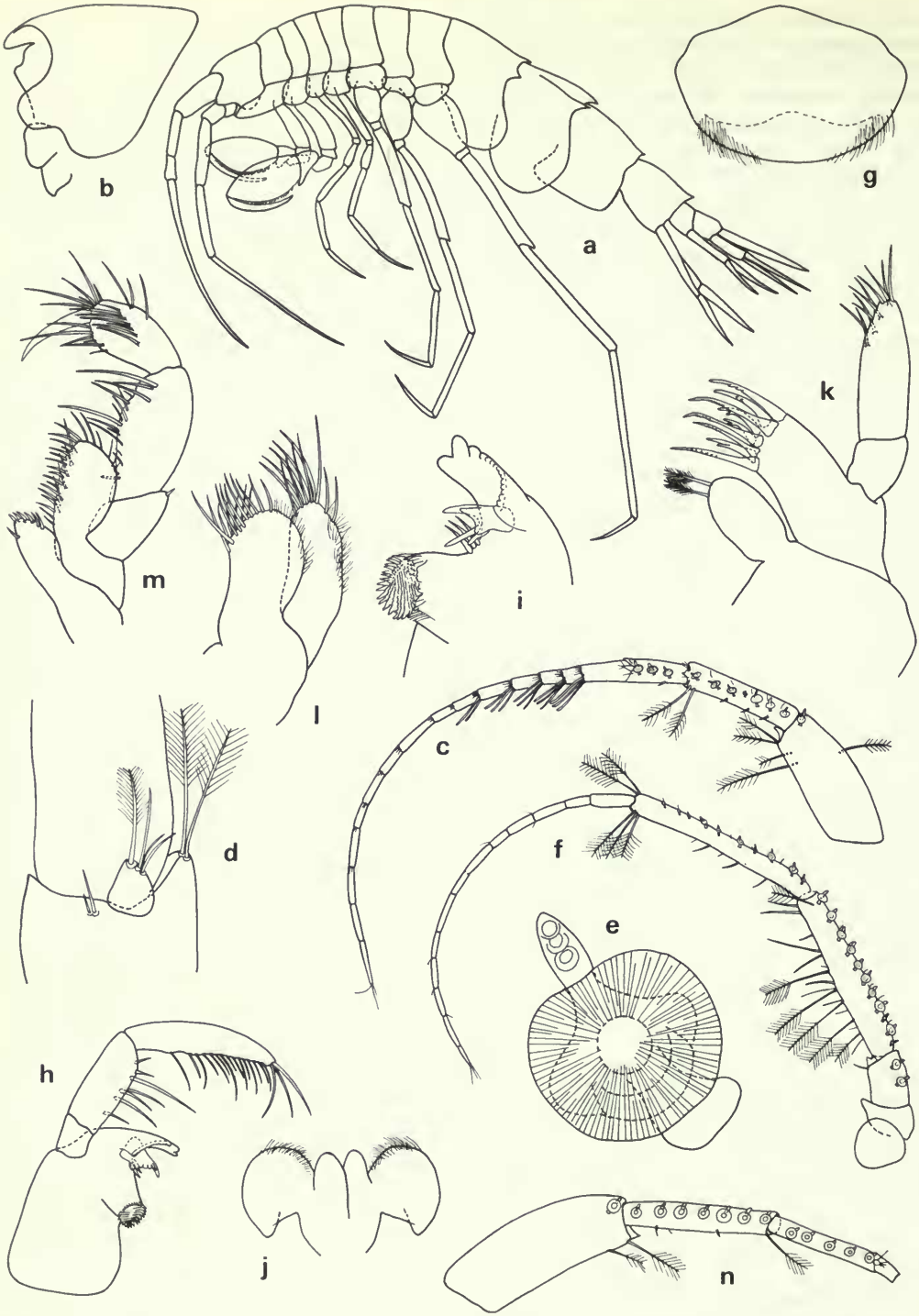

Fig. 3 *Rhachotropis thordisae* sp. nov. Holotype, male, 9mm. (a) habitus; (b) head; (c) antenna 1; (d) accessory flagellum; (e) calceolus from peduncle of antenna 1; (f) antenna 2; (g) upper lip; (h) left mandible; (i) right mandible, detail; (j) lower lip; (k–l) maxillae 1 & 2; (m) maxilliped. Allotype, female, 11mm. (n) antenna 1.

segment 3 carinate, mid-dorsal tooth small. *Epimera,* first rounded ventrally; second deep, rounded, somewhat flattened posterior-ventrally, with small submarginal spines ventrally and fine setae posteriorly; third, ventral margin straight, posterior margin gently convex, serrate. *Uromsome,* first segment weakly carinate carina ending in acute tooth.

Head, rostrum slightly downcurved, short, about one-fifth length of first peduncle article of antenna 1; eyelobes produced, rounded, apically somewhat obtuse, eyes not seen; post-antennal lobe weak; epistome produced in front of upper lip. *Antenna 1,* as long as head, peraeon and first pleon segment combined; first article of peduncle rather stout with short, acute tooth ventro-distally, just shorter than articles 2 and 3 combined, bearing single calceolus distally on medial surface; article 2 about four-fifths length of article 1 with seven calceoli medially; article 3 half length of article 2, three calceoli on medial surface; flagellum half as long again as peduncle, of 15 articles, the first five slightly expanded, bearing elongate aesthetes; accessory flagellum short, triangular. *Antenna 2,* just longer than antenna 1; article 3 short, toothed posterior-distally; articles 4 and 5 subequal in length; articles 3, 4 and 5 bearing two, eleven and eleven calceoli respectively along length of anterior-medial surfaces; flagellum a little shorter than peduncle, of 14 articles. *Upper lip* broadly rounded, setose disto-laterally. *Mandible,* incisor process, strong, with two or three teeth and long chitinized cutting edge; lacina mobilis of left mandible with curved multi-dentate cutting edge, of right mandible with five acute teeth; spine row of three pectinate spines; molar strong, triturating surface ridged and with strong marginal teeth; palp rather stout, longer than body of mandible; article 2 armed with stout setae; article 3 as long as articles 1 and 2 combined, setose along distal three-quarters of posterior margin. *Lower lip,* rather broad, inner lobes prominent, outer lobes densely setose distally. *Maxilla 1,* inner plate oval, bearing two plumose setae distally; outer plate with nine long, very slender dentate spines; palp article two with obliquely truncate apex bearing two rows of marginal and submarginal setae. *Maxilla 2,* small, inner plate broadly rounded with stiff setae medio-apically; outer plate narrower than inner, apex armed with stiff setae. *Maxilliped,* inner plate short with stout spines distally; outer plate armed with stout spines along medial margin; palp well developed, second article longest; dactyl rather slender, weakly curved, as long as third article.

Gnathopod 1, coxa with anterior-ventral angle strongly produced, anterior and ventral margins more than twice as long as posterior margin, posterior-distal angle with small tooth; basal somewhat expanded distally; carpus short, posterior lobe well developed, spinose; propod oval, nearly four times as long as carpus, palm gently convex, armed with graded ranks of pectinate setae; dactyl slender, curved, as long as palm. *Gnathopod 2,* coxa pentagonal, anterior-distal angle more prominent than posterior angle which bears small tooth; carpus strongly produced posteriorly, lobe bearing stout spines and setae; propod a little longer that that of gnathopod 1 but otherwise similar. *Peraeopod 3,* coxa small, trapezoidal, posterior-distal angle with small tooth; article 4 just more than half length of article 5; articles 5–7 subequal in length; dactyl very slender. *Peraeopod 4,* coxa small, height and width subequal, posterior distal angle not produced, posterior margin barely concave; articles 2–7 as in peraeopod 3. *Peraeopod 5,* coxa shallow bilobed, lobes subequal; basal expanded posteriorly, width three-fifths of length, posterior margin evenly rounded, serrate; merus and propod subequal; carpus just longer than merus, length twice that of basal, anterior margin bearing about 20 short spines in addition to longer spines and setae; dactyl very slender, distally curved, length three-fifths of carpus. *Peraeopod 6* a little longer than peraeopod 5; coxa bilobed, posterior lobe stronger and bearing small tooth posteriorly; articles 4–6 subequal in length, twice as long as basal; carpus armature similar to that of peraeopod 5; dactyl very slender, curved distally just more than half as long as propod. *Peraepod 7,* longer than peraeopod 6; coxa small, bearing three small teeth posterior-distally; basal oval, posterior margin serrate; carpus longer than merus, twice as long as basal; propod very slender, one-fifth longer than carpus; dactyl slender, curved distally, one-third length of propod.

Uropod 1, rami shorter than peduncle, narrowly lanceolate, margins finely pectinate.

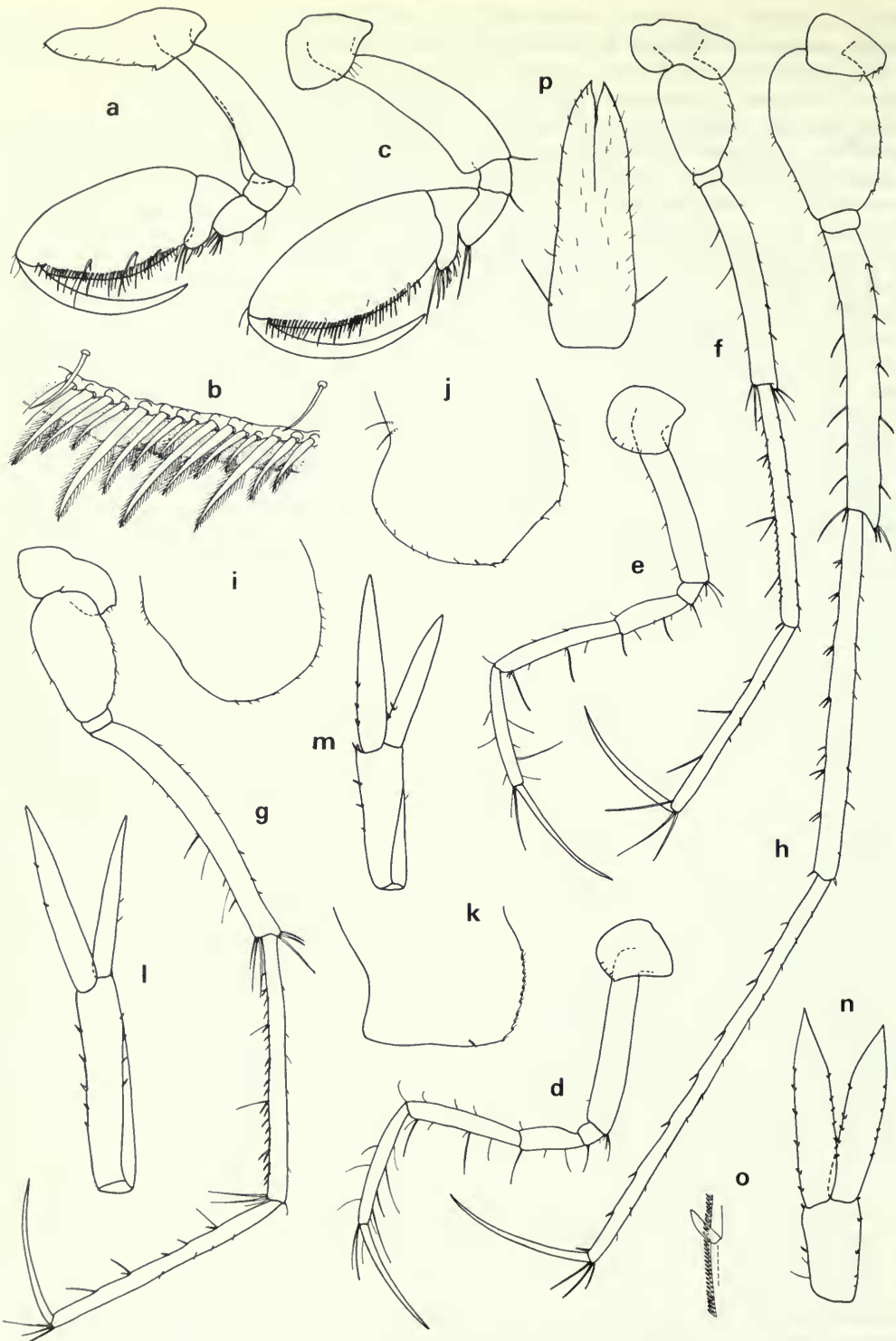

Fig. 4 *Rhachotropis thordisae* sp. nov. Holotype, male, 9mm. (a) gnathopod 1; (b) gnathopod 1, detail of palm; (c) gnathopod 2; (d–h) peraeopods 3–7; (i–k) epimera 1–3; (l–n) uropods 1–3; (o) uropod 3, margin of outer ramus; (p) telson.

Uropod 2, extends back only as far as apex of inner ramus of uropod 1, outer ramus and peduncle subequal in length, inner ramus one-fifth longer, margins of both rami finely pectinate. *Uropod 3,* rami broadly lanceolate, much longer than peduncle, all margins of rami pectinate and bearing short spines. *Telson* more than three times so long as wide, cleft 43% of length, margins subparallel over most of length tapering distally, apices acute, a little divergent.

Allotype, female, 11mm. Differs from holotype mainly in structure of antenna 1. *Antenna 1,* penduncle article 1 rather stout, bearing small tooth latero-distally and single discoidal calceolus medio-distally; article 2 more slender, four-fifths length of article 1, with 7 calceoli on medial surface; article 3 three-quarters length of article 2, bearing five calceoli medially; basal articles of flagellum not expanded, lacking aesthetes.

REMARKS. *R. thordisae* belongs to the group of species characterized by an edentate seventh peraeon segment, pleonites with three, three and one teeth respectively, urosomite 1 dentate and coxa 1 strongly produced.

Three other species also possess these characters. *R. kergueleni* can be separated from *R. thordisae* by the long rostrum, posteriorly serrate and posterior-distally produced basal articles of peraeopods 5–7, and shallowly cleft telson of the former species. *R. thordisae* and *R. proxima* are distinguishable by the short rostrum, calceolate antennae and deeply cleft, telson of the former. A further means of separation is the shape of the basal articles of peraeopods 5–7; posterior-distally rounded in the present species and acutely produced in *R. proxima. R. hunteri* differs from *R. thordisae* in possessing a long rostrum, and a very short outer ramus on uropod 2. *R. thordisae* also has a rather more deeply cleft telson (40% of length) than does *R. hunteri.*

R. leucophthalma, R. sibogae, R. integricauda, R. cervus and *R. flemmingi* conform to the basic diagnosis of *R. thordisae* except that all possess dorso-lateral teeth on pleonite 3. Additional characters separating these species from *R. thordisae* are the tricarinate pleonite 1 and urosomite 1, and the form of the basal article of peraeopod 7 of *R. leucophthalma*; the long rostrum, broadly rounded anterior-distal apex of coxa 1, posterior-distally produced basal article of peraeopod 7, and shallowly cleft telson of *R. sibogae*; the dorso-lateral carinae on pleonites 1 and 3, and the form of coxae 1, 4 and 6 and of epimeron 3 of *R. cervus*; and the posterior-distally produced basos and elongate propod and dactyl of peraeopod 7 and the less deeply cleft telson of *R. flemmingi. R. antarctica* and *R. clemens* both differ from *R. thordisae* in lacking teeth on pleonite 3. In addition *R. antarctica* has pleonites 1 and 3 and urosomite 1 tricarinate, and is oculate, while *R. clemens* has a relatively long rostrum, slender basal articles of peraeopods 5–6 and a shallowly cleft telson. *R. anoculata* lacks teeth on pleonite 3 and urosomite 1. *R. platycera* can be distinguished from *R. thordisae* by the possession of eyes and a tooth on peraeonite 7 in the former species. *R. levantis* has dorso-lateral carinae on pleonite 3 and urosomite 1 but lacks a tooth on the latter segment, and is further separated from *R. thordisae* by the long rostrum, and by the form of the basal articles of peraeopods 5–7 and epimeron 3.

Rhachotropis thorkelli sp. nov.
(Figs. 5–6)

MATERIAL EXAMINED. 1. Sta. 7709#73 4♂ 6–9mm, 1♀ 7mm, HOLOTYPE ♂ BM(NH) reg. no. 1978: 221 [carcase and four microscope preparations], ALLOTYPE 1978: 222, PARATYPE 1978: 223. Two paratypes have been retained at the Institute of Oceanographic Sciences.

ETYMOLOGY. Thorkell Thorbjornsson, elder brother of Gisli.

DESCRIPTION. Holotype, male, 9mm. *Pleon,* all segments weakly carinate dorsally; pleonites 1 and 2 each drawn out into a posteriorly directed dorsal tooth and a pair of large decumbent dorso-lateral teeth; pleonite 3, dorsal tooth prominent but not posteriorly produced. *Epimera,* first rounded ventrally, somewhat produced posteriorly; second, broadly rounded

at posterior-distal angle; third, broadly rounded posterior-distal angle armed with three small setae, posterior margin irregularly convex. *Urosome,* dorsally carinate, carina ending in acute tooth.

Head, rostrum deep, rather short, projecting beyond eyelobes; epistome rounded, sharply separated from medial crest on anterior of head. *Antenna 1,* as long as head, peraeon and first pleonite combined: first article of peduncle stout, just longer than more slender second article; third article about one-third as long as first; flagellum nearly half as long again as peduncle, basal part somewhat inflated, articles short and bearing many elongate aesthetes, distal articles long and slender; accessory flagellum minute. *Antenna 2,* nearly as long as body; peduncle article 5 slender, longer than articles 1–4 combined; flagellum nearly half as long again as peduncle, of 34 slender articles. *Upper lip,* broadly convex, setose. *Left mandible,* cutting edge entire with single distal tooth, lacina mobilis stout and with five teeth, two spines in spine row, molar prominent, ridged and toothed; palp much longer than body of mandible, article 3 slightly curved, densely setose along distal four-fifths of anterior margin, longer than articles 1 and 2 combined. *Right mandible,* incisor with long cutting edge armed with three teeth, lacina mobilis rather slender, with four teeth, spine row of three spines. *Lower lip,* inner lobes prominent, outer lobes densely setose. *Maxilla 1,* inner plate distally rounded, bearing subterminal plumose seta; outer plate with nine slender dentate or pectinate spines; palp rather slender, armed with setules and spines. *Maxilla 2,* inner plate broadly rounded, apex with fine setules, medial-distal angle armed with stout setae; outer plate more slender, rounded apex armed with spines and stout setae. *Maxilliped,* inner plate transversely truncate, bearing six stout spine teeth distally; outer plate broadly expanded, lateral-distal margin with long curved spines, inner margin with many slender spine teeth; palp long, well developed, article 2 the longest, articles 2 and 3 bearing many stout setae on and near medial margins, dactyl slender, rather shorter than article 3.

Gnathopod 1, coxa acutely produced, anterior and proximal margins subequal; basal expanded distally, channelled, with group of stout setae anteriorly; carpus short, posterior lobe well developed, bearing groups of long setae, and a stout spine apically; propod twice as long as wide, palm convex, armed with short, closely spaced spines; dactyl curved, as long as palm. *Gnathopod 2,* coxa broadly rounded, somewhat produced anteriorly; basal channelled anteriorly, distally expanded; carpus short, posterior lobe slender, strongly developed, reaching nearly to palmar spines; propod oval, rather longer than that of gnathopod 1, palm evenly convex, armed with short closely set spines; dactyl as long as palm. *Peraeopod 3,* coxa short, broadly rounded and somewhat produced anteriorly; basal slender; merus stout, short, two-fifths length of carpus; carpus slender subequal in length to basal and dactyl; propod about three-quarters length of carpus. *Peraeopod 4,* coxa somewhat produced and broadly rounded anteriorly, shallowly excavate posteriorly, posterior-distal angle rounded, obtuse; distal articles similar to those of peraeopod 3. *Peraeopod 5,* coxa bilobed, lobes subequal; basal somewhat expanded posteriorly, subrectangular; merus curved, more than twice as long as basal; distal articles lost. *Peraeopod 6,* coxa bilobed, anterior lobe short, subacute, posterior lobe strong, broadly rounded; basal slightly expanded, anterior and posterior margins parallel; merus curved, more than twice as long as basal, distal articles lost. *Peraeopod 7,* coxa suboval, produced posteriorly; basal expanded, margins parallel; merus straight, half as long again as basal; distal articles lost.

Uropod 1, inner ramus unarmed, one-tenth longer than outer ramus, three-quarters length of peduncle. *Uropod 2,* rami lanceolate, unarmed, inner equal in length to peduncle, outer three-quarters length of inner. *Uropod 3,* peduncle with seven short spines on inner margin; rami lanceolate, inner one-fifth and outer one-eighth longer than peduncle. *Telson,* long, linguiform, cleft 7% of length, apices acute, divergent.

Allotype, female, 7mm. *Pleon,* not carinate, pleonite 3 dorsal tooth posteriorly produced. *Antenna 1,* peduncle articles 1 and 2 equal in length and about twice as long as article 3; flagellum of seven slender articles, a little shorter than peduncle. *Antenna 2,* about one-fifth longer than antenna 1; peduncle articles 4 and 5 slender, fifth article one-sixth longer than fourth; flagellum three-fifths length of peduncle, consisting of ten slender articles.

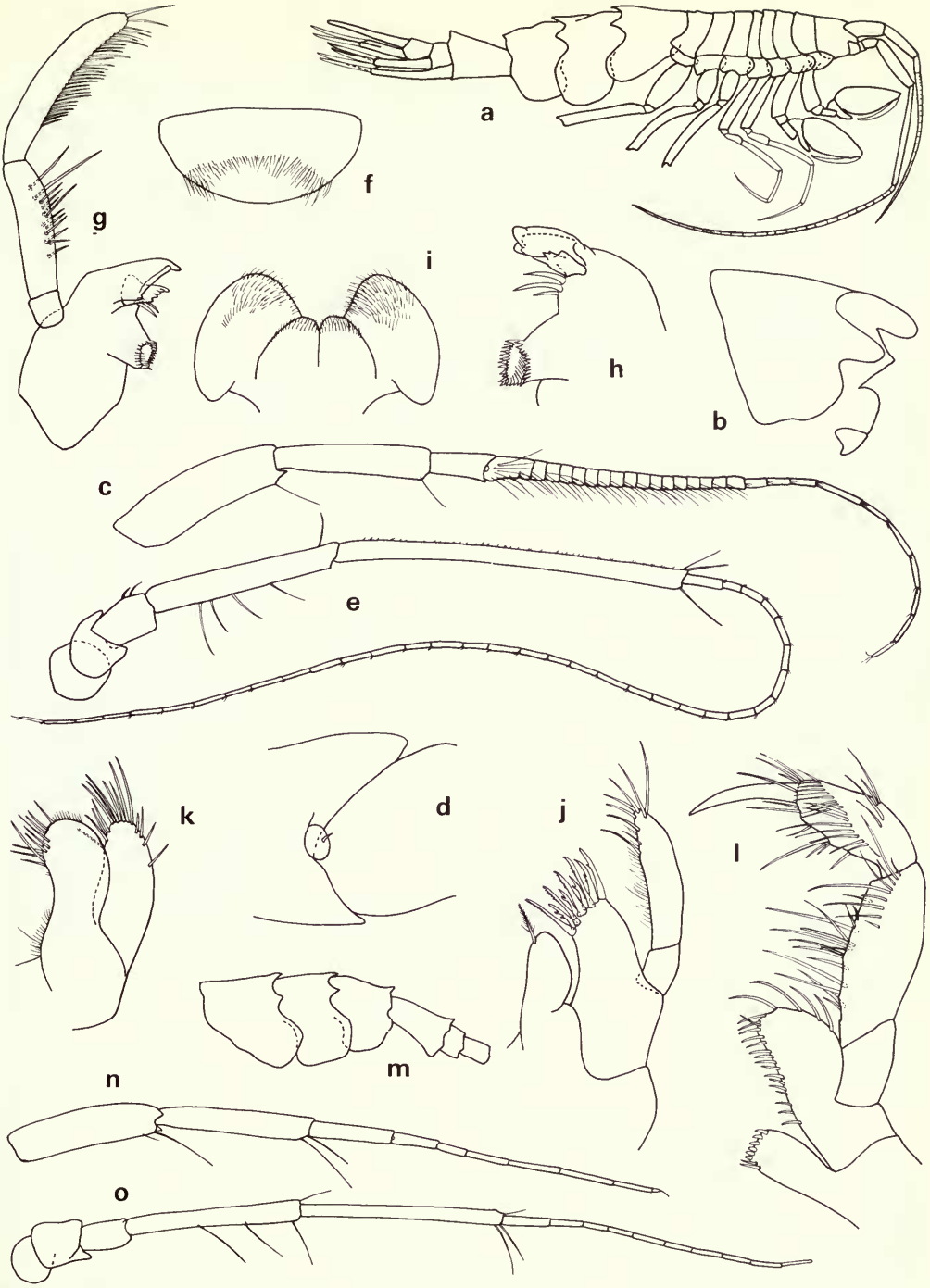

Fig. 5 *Rhachotropis thorkelli* sp. nov. Holotype, male, 9mm. (a) habitus; (b) head; (c) antenna 1; (d) accessory flagellum; (e) antenna 2; (f) upper lip; (g) left mandible; (h) right mandible, detail; (i) lower lip; (j–k) maxillae 1 & 2; (l) maxilliped. Allotype, female, 7mm. (m) pleon and urosome; (n–o) antennae 1 & 2.

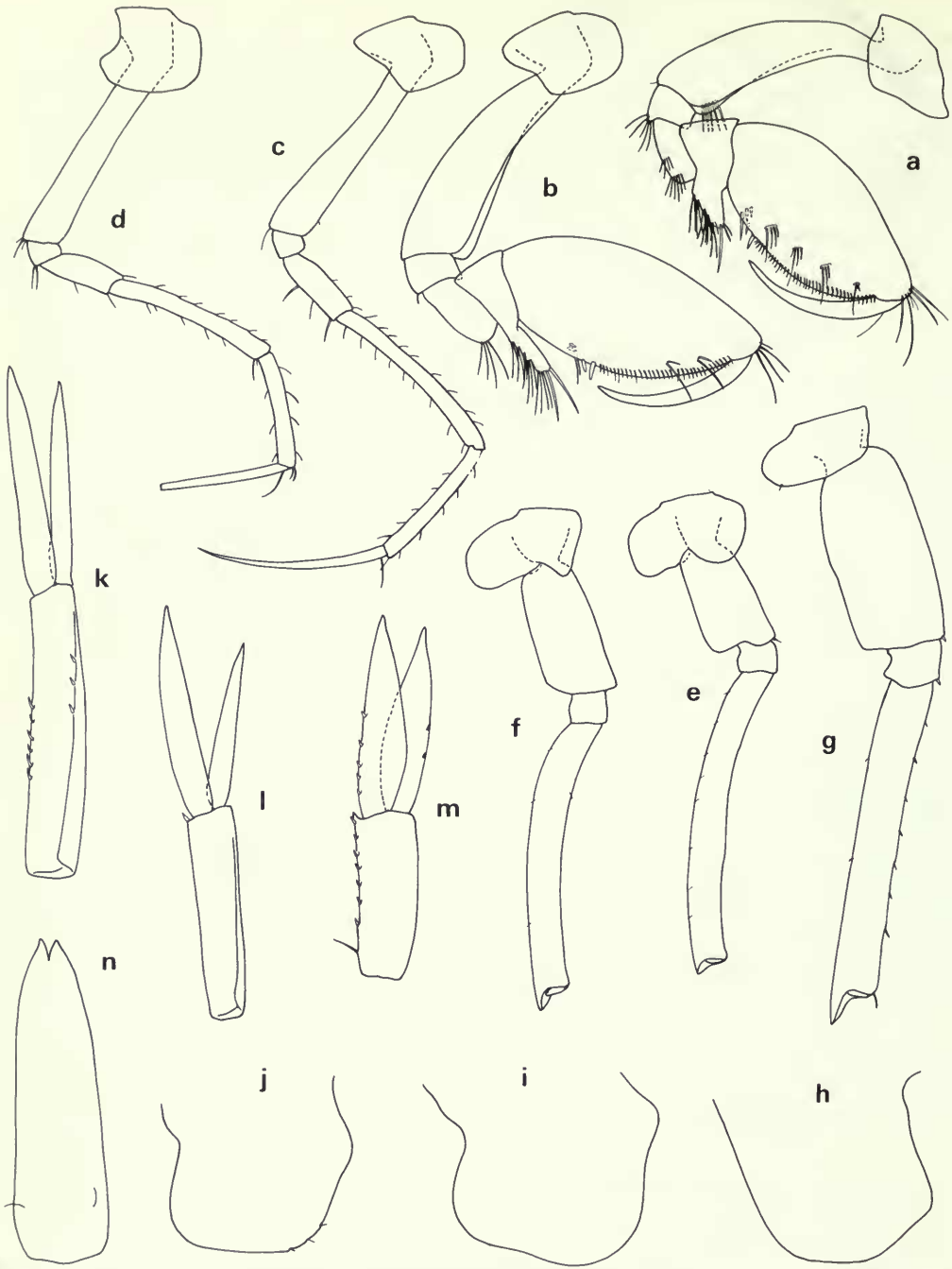

Fig. 6 *Rhachotropis thorkelli* sp. nov. Holotype, male, 9mm. (a–b) gnathopods 1 & 2; (c–g) peraeopods 3–7; (h–j) epimera 1–3; (k–m) uropods 1–3, (n) telson.

REMARKS. *R. thorkelli* belongs among those species which lack teeth on peraeonite 7, have three, three, one and one teeth on pleonites 1–3 and urosomite 1, and a weakly produced first coxa.

A weakly produced coxa 1 is a minority trend within *Rhachotropis*. Although a number of species have a pattern of dorsal armature agreeing with that of *R. thorkelli*, most also have coxa 1 strongly produced. *R. kergueleni, R. proxima, R. hunteri* and *R. thordisae* fall into this category. Further means of separating *R. thorkelli* from these species are the longer rostrum and strongly serrate basal articles of peraeopods 5–7 and epimeron 3 of *R. kergueleni;* the very long rostrum posteriorly produced basal articles of peraeopod 5–6 and form of epimeron 3 of *R. proxima;* the longer rostrum, short outer ramus of uropod 2 and more deeply cleft telson of *R. hunteri;* and the tricarinate pleonite 2, calceoliferous antennae, oval basal articles of peraeopods 5–7, serrate epimeron 3 and deeply cleft telson of *R. thordisae*. The condition of coxa 1 in *R. integricanda* has not been described, but this species can be separated from *R. thorkelli* by the uncleft telson and tridentate pleonite 3. Differences between the present species and a further new species with weakly produced coxa 1 are discussed on p. 61.

Rhachotropis gislii sp. nov.
(Figs. 7–8)

MATERIAL EXAMINED. Sta. 7709#62 1♂ 12mm, 2 damaged specimens; Sta. 7709#66 2♀ 11–13mm, 1 juv. 7mm, 1 damaged specimen; Sta. 7709 # 72 4♂ 9–12mm, 1 ovig. ♀ 12mm, 9♀ 8–13mm, 4 juv. 5–7mm; Sta. 7709 # 73 5♂ 10–12mm, 1 ovig. ♀ 13mm, 16♀ 8–14mm, 4 juv. 5–6mm, 1 damaged specimen, HOLOTYPE ♀ BM(NH) reg. no. 1978: 224 [carcase and 4 microscope preparations], ALLOTYPE 1978: 225, 3 PARATYPES 1978: 228, 13mm figured ♀ 1978: 226. Sta. 7709 # 85 2♂ 11–12mm, 3♀ 8–12mm, 3 juv. 7mm. Figured ♂, 11mm, BM(NH) reg. no. 1978: 227.

All registered type and figured material has been deposited in the Zoology Department of the British Museum (Natural History); other material has been retained at the Institute of Oceanographic Sciences.

ETYMOLOGY. Gisli, son of Thorbjorn Thorkellsson, whey-Thorbjorn.

DESCRIPTION. Holotype, female, 14mm. *Pleon,* each segment produced into posterior-dorsal tooth; pleonite 1, tooth acute, nearly vertical, strong backwardly projecting lateral teeth; pleonite 2, dorsal tooth long, slender, lateral carinae ending in backwardly projecting teeth; pleonite 3, dorsal tooth weakly carinate anteriorly, backwardly projecting. *Epimera,* first rounded; second, distally rounded, posterior margin nearly straight, finely serrate posteriorly on distal margin; third subrectangular, serrate distally and posteriorly. *Urosome,* first segment without tooth or lateral carinae.

Head, humped dorsally near posterior margin, rostrum rather short, concave transversely near base; eyelobes projecting somewhat ventrally, as long as rostrum, distally rounded; post-antennal lobe broadly rounded, weak; epistome, broadly rounded, just projecting beyond upper lip. *Antenna 1,* article 1 rather stout, shorter than head, subequal to more slender second article; article 3 one-third length of article 2; flagellum not much longer than peduncle, of 15 articles; accessory flagellum very small, articulated, bearing three short subterminal spines. *Antenna 2,* a little longer than antenna 1, peduncle articles 4 and 5 subequal; flagellum just shorter than peduncle, of 19 articles. *Upper lip,* broadly rounded with subapical corona of setae. *Mandibles,* incisor process strongly chitinized with one or two blunt teeth ventrally; lacina mobilis of left mandible with five blunt teeth, of right mandible with three digitate teeth; spine row with three or four stout spines; molar process columnar with prominent teeth and ridges on triturating surface; palp shorter than body of mandible, third article, slender, just shorter than second, bearing eight setae disto-laterally. *Lower lip,* inner lobes prominent, outer lobes densely setose. *Maxilla 1,* inner plate distally truncate, two plumose setae at medio-distal angle; outer plate with nine slender pectinate or dentate

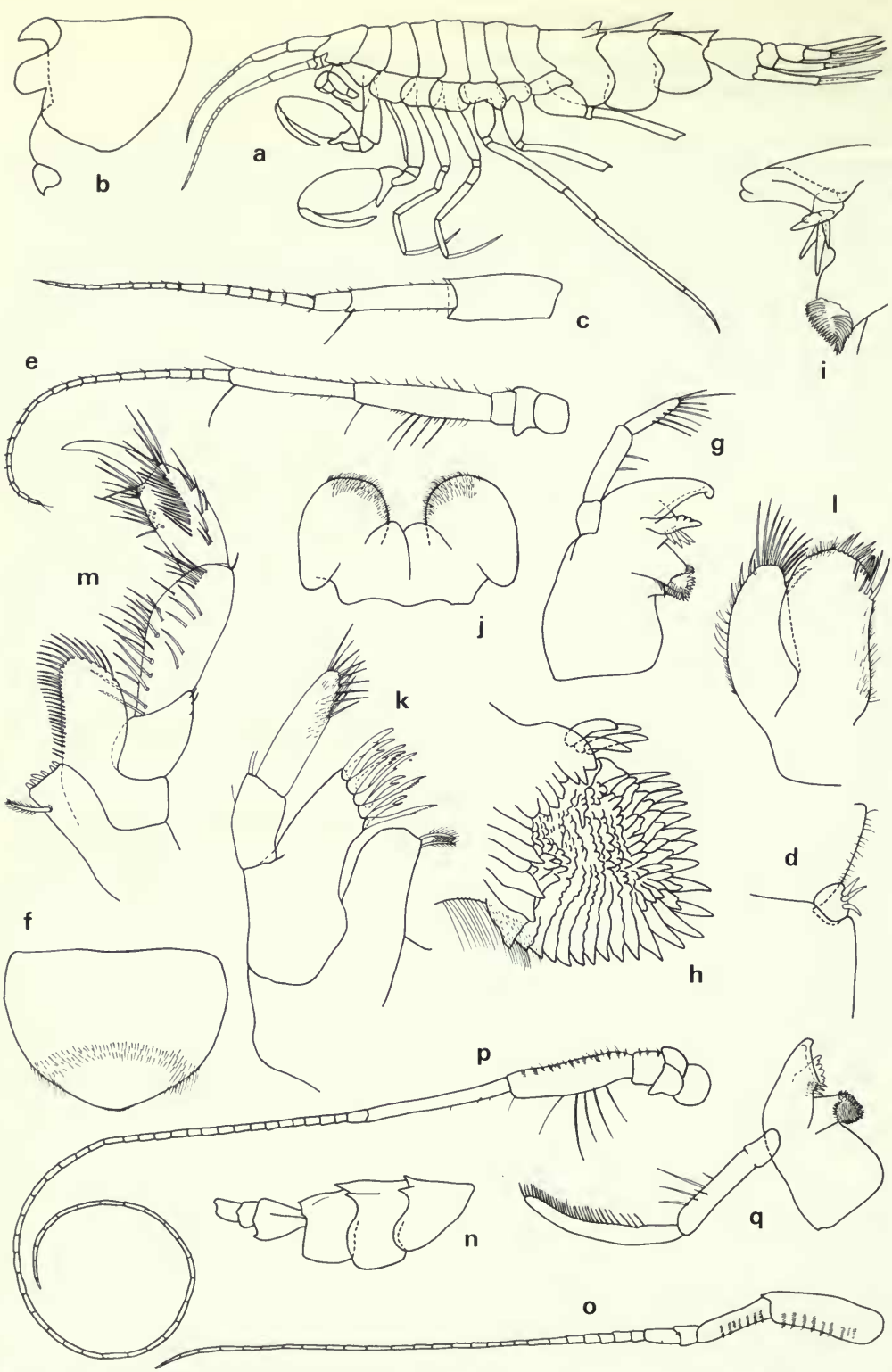

Fig. 7 *Rhachotropis gislii* sp. nov. Holotype, female, 14mm. (a) habitus; (b) head; (c) antenna 1; (d) accessory flagellum; (e) antenna 2; (f) upper lip; (g) left mandible; (h) left mandible, molar process; (i) right mandible, detail; (j) lower lip; (k–l) maxillae 1 & 2; (m) maxilliped. Allotype, male, 12mm. (n) pleon and urosome; (o–p) antennae 1 & 2; (q) left mandible.

spine teeth distally; second palp article slender, apically rounded, bearing spines distally. *Maxilla 2,* short, inner plate as long as outer, rounded, short spines clustered medio-distally; outer plate more slender than inner with three stout spines disto-laterally and series of spine setae on rounded apex. *Maxilliped,* inner plate distally truncate, bearing six short spine teeth; outer plate extending just beyond apex of first article of palp, rather slender, armed medially and distally with graded series of closely set spines; palp well developed, second article the longest, third article armed with many stout setae, dactyl strong.

Gnathopod 1, coxa weakly produced, anterior-distal angle acute; basal anteriorly channelled, with short spines along the length of anterior margin; carpus short, posterior lobe well developed, spinous; propod broadly oval, palm convex, four-fifths length of posterior margin; dactyl curved, as long as palm. *Gnathopod 2,* coxa broadly rounded anteriorly, somewhat produced; basal similar to but a little longer that that of gnathopod 1, bearing fine spines anteriorly; posterior lobe of carpus elongate, densely spinose on medio-posterior surface; propod of same form as that of gnathopod 1 but a little larger, palmar margin armed with ranked spines and pectinate setae; dactyl as long as palm. *Peraeopod 3,* coxa produced anteriorly, rectangular; basal long, slender with comb-like group of spines at posterior-distal angle; articles 4–7 lost. *Peraeopod 4,* coxa longer than deep, pentagonal, distal margin, just concave, emarginate posteriorly, posterior-distal angle subacute; basal slender, armature similar to that of peraeopod 3; merus short, about twice so long as wide, anterior margin convex; carpus twice as long as merus, a little longer than propod; dactyl very slender, as long as basal. *Peraeopod 5,* coxa bilobed, posterior lobe longer but more narrowly rounded than anterior lobe; basal somewhat expanded posteriorly; merus elongate, more than twice as long as basal; carpus relatively short, barely longer than merus; dactyl very slender, half length of propod. *Peraeopod 6,* coxa produced and rounded posteriorly, ventrally rectangular; basal rather narrow, length more than twice width, submarginal row of setae posteriorly; merus slender, twice length of basal; articles 5–7 lost. *Peraeopod 7,* coxa strongly produced posteriorly, posterior-distal angle acute; basal narrowly oval, merus less than twice length of basal; articles 5–7 lost.

Uropod 1, peduncle with two spines on lateral margin and three on median margin, rami narrowly lanceolate, inner as long as peduncle, one-tenth longer than outer. *Uropod 2,* not extending as far back as apices of uropod 1; peduncle two-thirds length of inner ramus; rami narrowly lanceolate, inner ramus very slender apically, with five spines on inner margin; outer ramus about three-quarters as long as inner ramus. *Uropod 3,* peduncle short; rami lanceolate, bearing spines on inner margins, outer ramus one-eighth shorter than inner; rami of all uropods microscopically pectinate. *Telson* linguiform, bearing two setae basally and scattered minute setules dorsally, cleft about one-third of total length, apices not dehiscent.

Allotype, male, 12mm. Sexual dimorphism in this species is greater than is the case in most of the better known species in the genus. Differences between the sexes are shown by the pleon armature, antennae, mandibular palp and possibly the posterior peraeopods.

Pleon, teeth on pleonites 1 and 2 similar in form to those of the female, but less strongly produced, pleonite 3 tooth carinate but not produced distally, the carina being truncate with a small backwardly directed tooth at the posterior-distal extremity. *Antenna 1,* peduncle article 2 two-thirds length of article 1, both articles with transverse rows of short setae on medio-ventral surfaces; article 3 very short; barely longer than wide; flagellum two-and-a-half times length of peduncle, filiform, of 27 articles. *Antenna 2,* four-fifths longer than antenna 1, peduncle articles 3 and 4 with ranks of short setae opposed to those on peduncle of antenna 1; article 4 stouter but just shorter than article 5; flagellum nearly three times length of peduncle, filiform, of 51 articles. *Mandible,* palp slender much longer than body of mandible; article 3 slender, longer than articles 1 and 2 combined, armed with short setae over distal four-fifths of posterior margin. *Peraeopod 7,* basal oval; merus much longer than basal, a little shorter than carpus; propod slender, straight, one-third longer than carpus; dactyl slender, two-fifths length of carpus.

Remarks. *R. gislii* belongs among those species in which the dorsal armature is restricted to

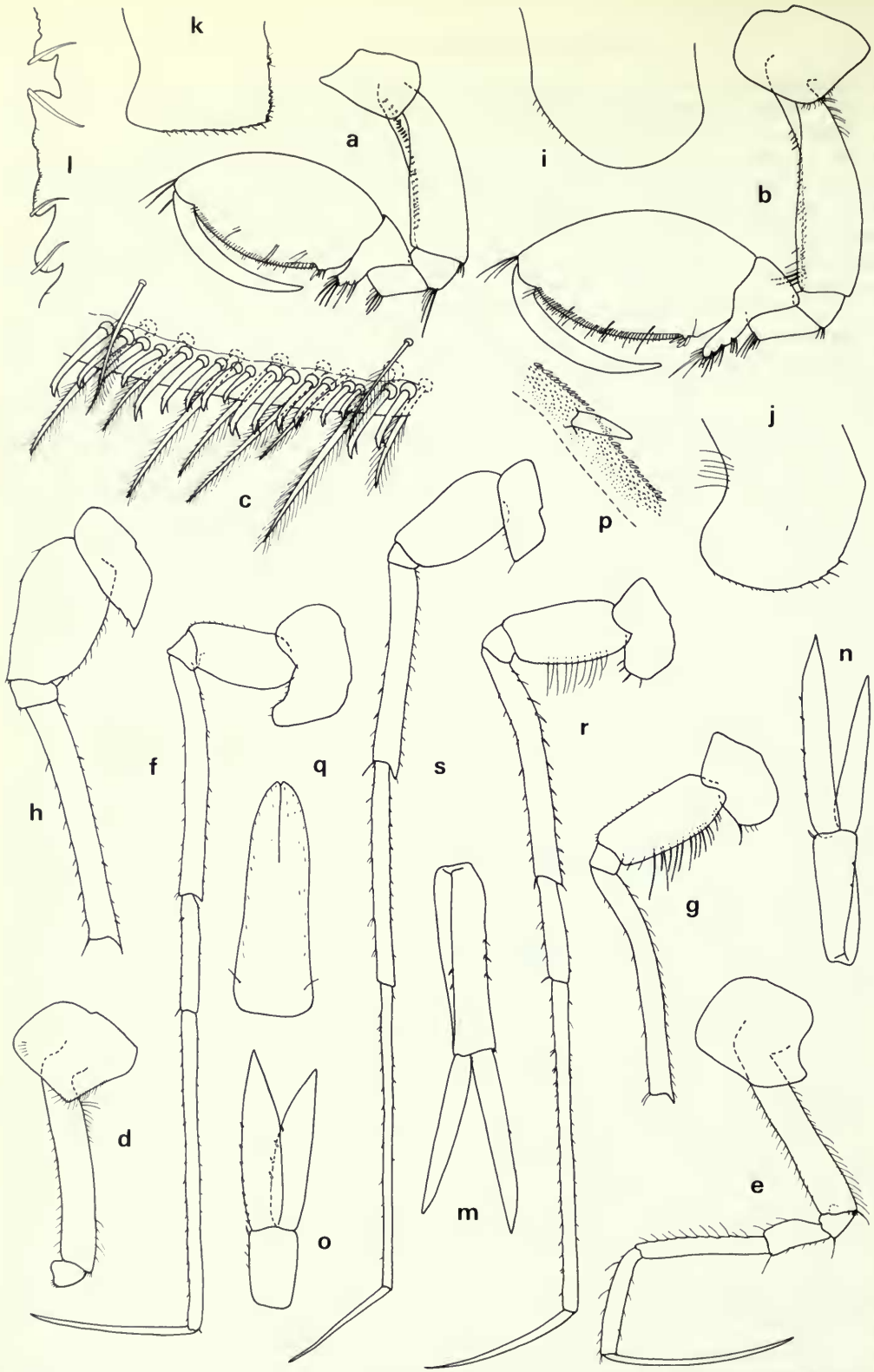

Fig. 8 *Rhachotropis gislii* sp. nov. Holotype, female, 14mm. (a–b) gnathopods 1 & 2; (c) gnathopod 2, detail of palm; (d–h) peraeopods 3–7; (i–k) epimera 1–3; (l) epimera 3, detail; (m–o) uropods 1–3; (p) uropod 3, margin of outer ramus; (q) telson. Paratype female, 13mm. (r) peraeopod 6. Paratype male, 11mm. (s) peraeopod 7.

three, three and one teeth respectively on pleonites 1–3, and which have a weakly produced first coxa.

Only three species of *Rhachotropis* combine an edentate urosomite 1 with a weakly produced coxa 1. Of those, *R. elegans* Bonnier, 1896 and *R. gubilata* Barnard, 1964 are distinguished from the present species by a tridentate pleonite 3. The stout, serrate basal article of peraeopod 7 and broadly rounded epimeron 3 of *R. elegans,* and strong posterior teeth on the basal articles of peraeopods 5–7 and weakly cleft telson of *R. gubilata* afford further means of separating these species from *R. gislii.* The third species, *R. natator* (Holmes, 1908), is a weakly dentate entity, bearing single teeth on pleonites 2 and 3 only. This condition contrasts with that found in *R. gislii* as does the weakly cleft telson. *R. grimaldii* (Chevreux, 1887), which has been regarded as synomymous with *R. elegans* by several authors (Barnard, 1916; Stephensen, 1944*a*; Gurjanova, 1955; Barnard, 1957) differs from *R. gislii* in having a tridentate pleonite 3, strongly produced coxa 1, broadly rounded and strongly serrate epimeron 3, broad peraeopod 7 basal article, and large eyes. The dorsal armature of *R. levantis* and *R. thorkelli* resembles that of *R. gislii* but the former species has a long rostrum, moderately produced and anterior-ventrally rounded coxa 1, broad peraeopod 7 basal article, serrate epimeron 3 and calceolate antennae, while the latter has a dentate urosome, slender basal articles of peraeopods 5–7, and a shallowly cleft telson. *R. anoculata* and *R. luculenta* Barnard, 1969 both have strongly produced first coxae and lack teeth on pleonite 3, although in the former this segment has a prominent posterior margin. *R. anoculata* has calceolate antennae and a more deeply cleft telson than does *R. gislii* while *R. luculenta* differs in having eyes, a long rostrum, calceolate antennae, broad peraeopod 5–6 basal articles and a more deeply cleft telson.

Rhachotropis arii sp. nov.
(Figs. 9–10)

MATERIAL EXAMINED. St. 7709#62 1♂ 10mm, 1♀ 14mm, 1 damaged specimen. Sta. 7709#66 1♂ 12mm, 2♀ 14mm. Sta. 7709#72 4♂ 12mm, 9♀ 6–14mm, 2 juv. 6mm. ALLOTYPE ♀ BM(NH) reg. no. 1978: 230. Sta. 7709#73 1♀ 15mm, 1 damaged specimen. Sta. 7709#85 3♂ 12mm, 1♀ 10mm, 1 juv. 6mm. HOLOTYPE ♂ BM(NH) reg. no. 1978: 229 [carcase and 4 microscope preparations], PARATYPES 1978: 231.

The registered type material has been deposited in the collections of the Zoology Department of the British Museum (Natural History); all remaining material has been retained at the Institute of Oceanographic Sciences.

ETYMOLOGY. Ari Thorbjornsson, younger brother of Gisli.

DESCRIPTION. Holotype male, 12mm. *Pleon,* segments 1 and 2 each slightly humped, with low dorsal tooth; segment 3 carinate, the carina ending in a small posteriorly directed tooth. *Epimera,* first and second rounded; third sub-rectangular, not serrate on posterior or ventral margins. *Urosome,* first segment carinate, the carina produced posteriorly into a tooth.

Head, rostrum short, spatulate; eyelobes produced, rounded, extending almost as far as rostrum; post-antennal angle rounded; epistome not produced beyond upper lip. *Antenna 1,* filiform, as long as head, peraeon and pleon combined; first article of peduncle rather stout, longer than articles 2 and 3 combined; article 3 short, length hardly greater than width; flagellum of 38 articles, about three times length of peduncle, basal fifth somewhat expanded, conjoint, bearing large numbers of long, filamentous aesthetes; accessory flagellum minute. *Antenna 2,* subequal in length to body; distal articles of peduncle bearing many short spine-setae dorso-medially; article 5 very slender, longer than articles 1–4 combined: flagellum filiform, rather less than twice as long as peduncle, of 42 articles, each article bearing a sub-terminal cluster of fine setae. *Upper lip,* rounded, bearing corona of fine setae. *Mandible,* incisor process strong, heavily chitinized, with single distal tooth and long cutting edge; lacina mobilis of left mandible with six blunt teeth, that of right bidentate; spine row with three stout pectinate spines; molar process columnar, triturating surface strongly

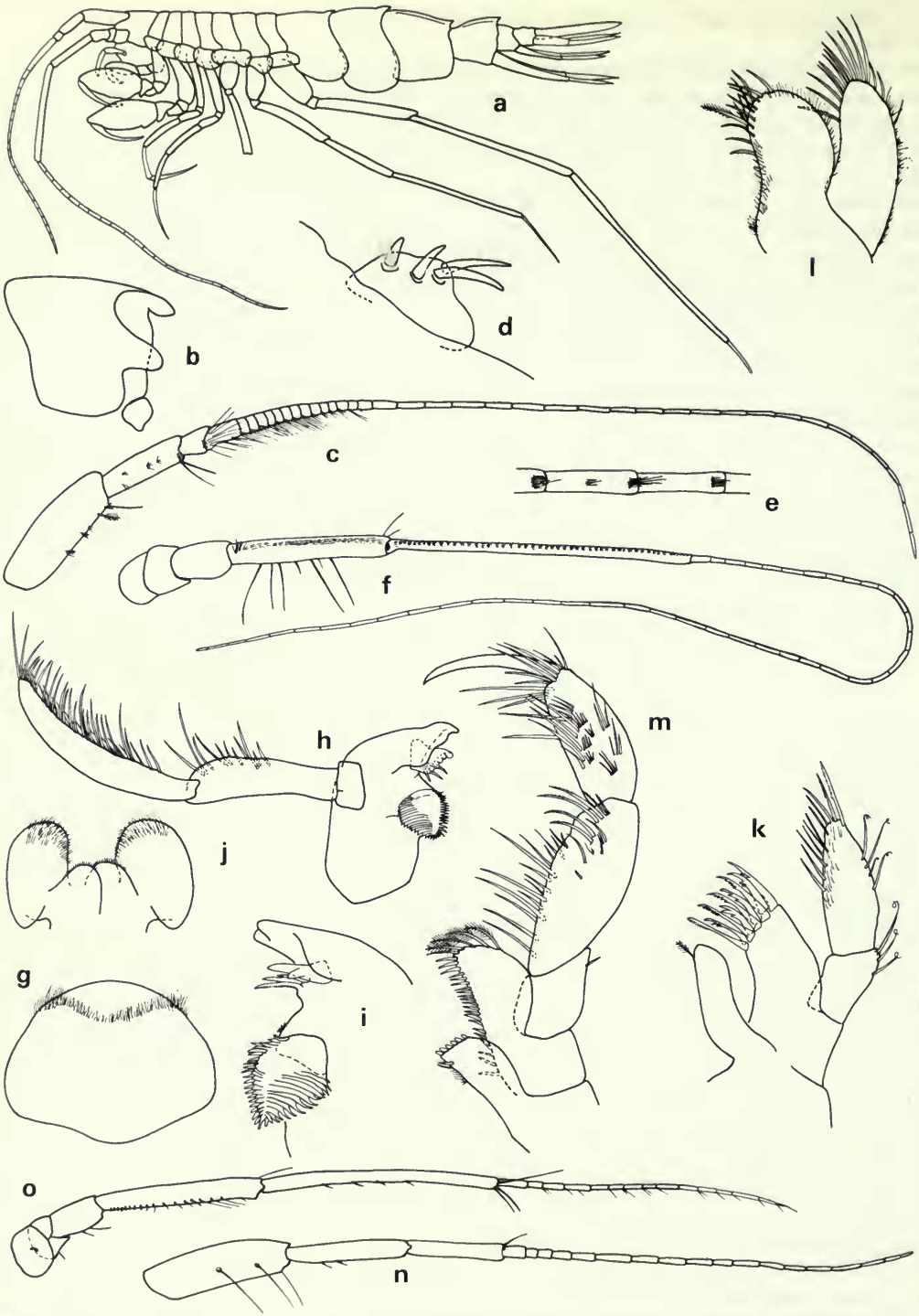

Fig. 9 *Rhachotropis arii* sp. nov. Holotype, male, 12mm. (a) habitus; (b) head; (c) antenna 1; (d) accessory flagellum; (e) antenna 1, flagellum articles; (f) antenna 2; (g) upper lip; (h) left mandible; (i) right mandible, detail; (j) lower lip; (k–l) maxillae 1 & 2; (m) maxilliped. Allotype, female, 12mm. (n–o) antennae 1 & 2.

toothed and ridged; palp long, third article as long as body of mandible, falciform, posterior margin strongly armed with slender spines and stout setae over most of length. *Lower lip,* inner lobes prominent. *Maxilla 1,* inner plate slender, distally rounded, bearing a single, subterminal plumose seta; outer plate with nine slender dentate or pectinate spines; second article of palp narrowly rounded distally, both margins armed with setae, those of outer margin tipped with spiral filaments. *Maxilla 2,* inner plate broad, rounded, armed with single plumose seta and two ranks of slender spines medio-distally; outer plate as long as inner but barely half the width, armed distally with long slender spines. *Maxilliped,* inner plate short, apically transversely truncate, with six stout spine teeth; outer plate small, hardly extending beyond apex of first palp article, armed with plumose setae distally and slender spine-teeth medially; palp well developed, second article longest, second and third articles strongly setose and spinose, fourth article slender, curved, subequal in length to third article.

Gnathopod 1, coxa rather weakly produced, anterior margin shorter than basal margin, anterior-ventral angle rounded; basal expanded distally; carpus short, posterior lobe well developed, strongly setose; propod oval, palm three-quarters length of posterior margin, armature similar to that of *R. grimi;* dactyl slender, as long as palm. *Gnathopod 2,* coxa rounded, somewhat produced anteriorly; carpus short, posterior lobe extending to palmar angle of propod, strongly setose; propod similar to that of gnathopod 1 but slightly larger. *Peraeopod 3,* coxa small, rounded, anteriorly produced; basal slender; merus half length of carpus; carpus and dactyl slender, subequal, a little longer than propod. *Peraeopod 4,* coxa produced anteriorly, broadly rounded, ventral margin concave, posteriorly excavate, posterior-ventral angle sub-acute; basal slender; merus just more than half length of carpus; propod seven-eighths length of carpus; dactyl very slender, one-fifth longer than carpus. *Peraeopod 5,* coxa bilobed, lobes equal; basal narrowly oval; merus curved, more than twice as long as basal; distal articles lost. *Peraeopod 6,* coxa strongly produced posteriorly, basal narrowly oval; merus and carpus gently curved, subequal; propod elongate, equal in length to merus and carpus combined; dactyl curved, very slender, three-eighths length of propod. *Peraeopod 7,* immensely elongate, length exceeds total length of animal; coxa posteriorly produced, lobe distally truncate; basal oval, just more than half length of merus; carpus, three-quarters as long again as merus; propod extremely slender, half as long again as carpus; dactyl damaged, but apparently short, probably not more than one-fifth length of propod.

Uropod 1, rami narrowly lanceolate, subequal, two-thirds length of peduncle. *Uropod 2,* not quite reaching apex of uropod 1; rami narrowly lanceolate, inner nine-tenths length of peduncle, outer seven-tenths. *Uropod 3,* peduncle rather stout, medial margin strongly spinose; rami subequal, three-fifths longer than peduncle, margins spinous and pectinate. *Telson,* linguiform with two setae basally and scattered minute setules dorsally, cleft for one-tenth of length, apices acute, dehiscent.

Allotype, female, 12mm. *Pleon,* segment 3 with low carina ending in small acute tooth. *Urosome,* segment 1 with low posteriorly dentate carina. *Antenna 1,* first peduncle article stout; second and third slender, together half as long again as first, third three-quarters length of second; flagellum a little longer than peduncle, of 17 articles; accessory flagellum minute. *Antenna 2,* subequal in length to antenna 1; peduncle article 5 slender, nearly as long as articles 1–4 combined; flagellum two-fifths length of peduncle, of 15 articles.

REMARKS. *R. arii* belongs to those species having single median teeth on pleonites 1–3 and urosomite 1, and a weakly produced first coxa.

During a redescription of *R. gracilis* Bonnier, 1896 (Thurston, in prep.), it became apparent that several slight but apparently significant differences exist between the present specimens and Bonnier's type material. The easiest means of separation lies in the form of coxa 2 and coxa 4. Coxa 2 of *R. arii* is evenly rounded anteriorly while that of *R. gracilis* is distally truncate. Coxa 4 of the latter species is rectangular, and lacks the posterior-distal projection found in *R. arii.* The new species is characterized by a very short accessory

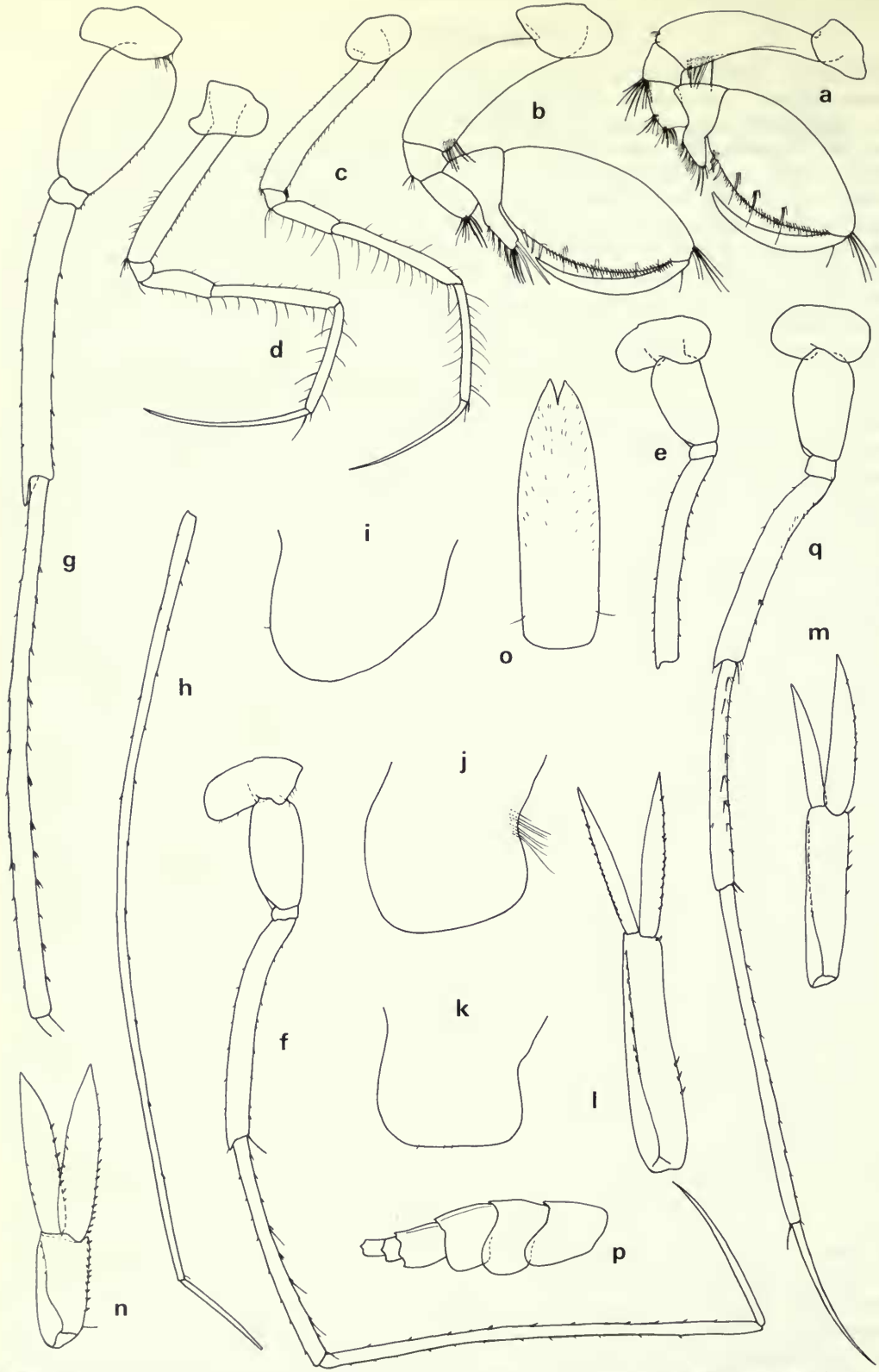

Fig. 10 *Rhachotropis arii* sp. nov. Holotype, male, 12mm. (a–b) gnathopods 1–2; (c–f) peraeopods 3–6; (g–h) peraeopod 7; (i–k) epimera 1–3; (l–n) uropods 1–3; (o) telson. Allotype, female, 12mm. (p) pleon and urosome; (q) peraeopod 5.

flagellum armed with four spines, a weakly produced upper lip, maxilla 1 inner plate slender and armed with a single plumose seta, and epimeron 3 smooth posterior-distally. In contrast, *R. gracilis* has an accessory flagellum which is longer than wide and armed with a single long setae, a relatively strongly produced upper lip, maxilla 1 inner plate oval and bearing two plumose setae distally, and epimeron 3 crenelate posterior-distally. In male specimens the structure of antenna 1 peduncle differs, the second article being three-fifths the length of the first in *R. arii* but subequal to it in *R. gracilis.* These differences are not large, and future research may show them to be of intra-specific value only. Until that time I prefer to maintain the two entities as separate species.

Three previously described species of *Rhachotropis,* in addition to *R. gracilis,* have each pleonite armed only with a single median tooth. Both *R. faeroensis* Stephensen, 1944 and *R. ludificor* Barnard, 1967 are distinguished from *R. arii* by their strongly produced first coxae. In addition, *R. faeroensis* has a rostrum half as long as the first peduncle article of antenna 1, epimeron 3 evenly rounded and posterior-distally serrate, calceolate antennae and the basal article of peraeopod 7 with a sub-acute posterior-distal lobe. Further characters separating *R. arii* and *R. ludificor* lie in the longer rostrum, rounded and serrate epimeron 3, shorter and more deeply cleft telson and produced posterior-distal lobe of peraeopod 7 basal article of the latter. *R. portoricana* Barnard, 1964 has a strongly deflexed rostrum, edentate urosomite 1 and lobate peraeopod 7 basal article, all characters not found in *R. arii.*

Apart from *R. gracilis,* two other species combine a dentate urosomite 1 and weakly produced coxa 1. *R. anomala* Barnard, 1916 is similar in many characters to *R. arii* but can be distinguished by the lack of teeth on pleonites 1 and 3 and the non-dehiscent apices of the telson.

Two other species have weakly produced first coxae. *R. thorkelli* has tridentate pleonites 1 and 2, and rectangular rather than oval basal articles on peraeopods 5–7. *R. natator* resembles *R. arii* but lacks median teeth on pleonite 1 and urosomite 1, and is further distinguished by the form of the telson, the slender propods of gnathopod 1 and 2, and the acute anterior-distal angle of coxa 2.

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